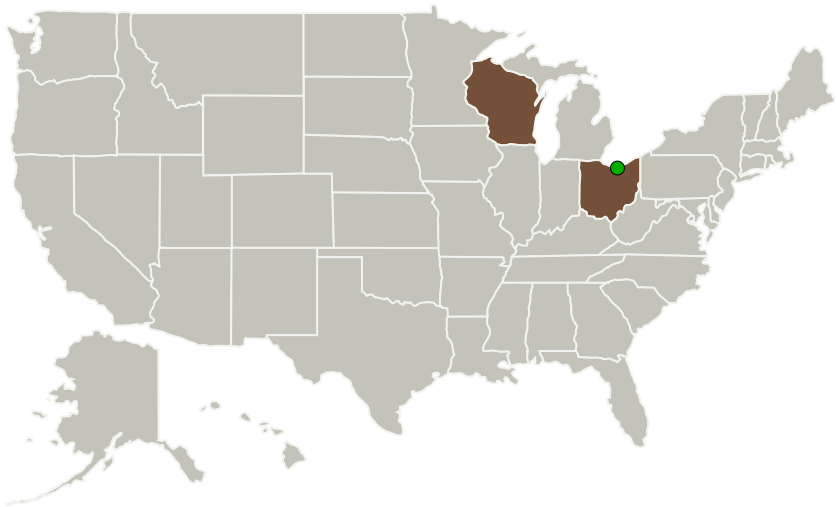
Integrated Composite Rocket Nozzle Extension, Phase I

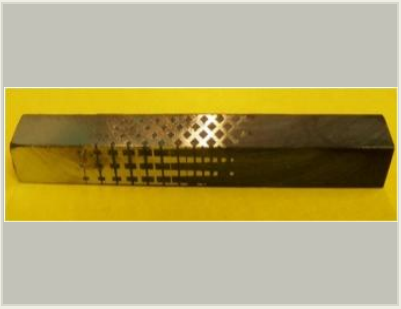
Completed Technology Project (2013 - 2013)

Project Introduction

ORBITEC proposes to develop and demonstrate an Integrated Composite Rocket Nozzle Extension (ICRNE) for use in rocket thrust chambers. The ICRNE will utilize an innovative bonding approach to join a high-temperature composite nozzle extension to a regeneratively cooled metallic nozzle. The ICRNE technology will allow high-temperature composite materials to be directly integrated into a regeneratively-cooled nozzle section or thrust chamber made out of high-strength metallic alloys, thereby eliminating the heavy bolted flange joint that is currently used to attach high-temperature nozzle extensions. The resulting weight reduction will increase the thrust-to-weight ratio of the rocket engine. The ICRNE will also eliminate the need for multiple seals in the bolted flange joints, thus increasing reliability. The focus of the proposed Phase 1 effort will be to demonstrate the ICRNE technology by manufacturing and evaluating test specimens. A prototype ICRNE will also be designed and analyzed. In Phase 2, a prototype ICRNE unit will be fabricated, installed, and hot fire tested on an existing rocket engine. This proposal responds to Subtopic H2.02 In-Space Propulsion Systems, specifically "high temperature materials, coatings and/or ablatives or injectors, combustion chambers, nozzles, and nozzle extensions" for non-toxic, cryogenic, and nuclear thermal propulsion systems.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Sierra Nevada Corporation(SNC)	Lead Organization	Industry Women-Owned Small Business (WOSB)	Sparks, Nevada
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Wisconsin

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138671)*

Images

Project Image
Integrated Composite Rocket Nozzle Extension
(https://techport.nasa.gov/image/130533)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sierra Nevada Corporation (SNC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

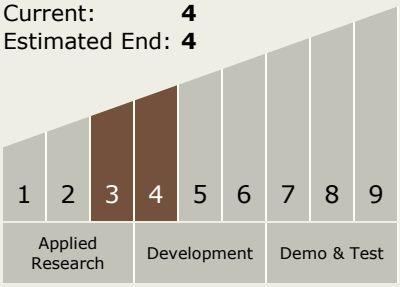
Carlos Torrez

Principal Investigator:

Robert J Gustafson

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System